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Use of a national database as a tool to identify primary medication non-adherence: The Estonian ePrescription system

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ABSTRACT

Background: Medication adherence can be divided into primary and secondary adherence. Primary medication non-adherence (PMN) occurs when a patient does not obtain medicine with their initial prescription. Secondary non-adherence measures prescription refills among patients who previously filled their first prescription. While secondary non-adherence has been studied thoroughly, PMN has been assessed less extensively, due to lack of available data. Estonian ePrescription system might prove a valuable tool for this.

Objectives: The aim of this study was to evaluate PMN and the interval between prescribing and dispensing of medicines using the Estonian ePrescriptions database to establish its potential use for this purpose and for other qualitative drug utilization research measures. Osteoporosis medicines were used as an example.

Methods: The Estonian Prescription Centre was used to evaluate if patients purchase medicines after initial prescription of osteoporosis medicine. Prescriptions from 2012 to 2015 of all patients over 18 were included. PMN was defined as the first prescription not being dispensed before it expired (60 days). The rate of PMN was calculated.

Results: Estonian ePrescription System enabled fast evaluation of PMN of osteoporosis patients based on data about prescribing, dispensing and time intervals in-between. Of patients who started osteoporosis treatment 13.1% were primary non-adherent. Of primary non-adherent patients 42% still started treatment at some point during the study. Of patients who did purchase their first prescription 80.4% did so within a week and 95% within 25 days.

Conclusion: The Estonian ePrescription system is a useful tool for monitoring PMN. The PMN of osteoporosis medicines was identified as lower than previously reported. More similar type of studies about other groups of medicines would be needed to understand the pattern of PMN and give valuable information to healthcare specialists about how to increase initiation of treatment.

1. Introduction

Adherence to medication is defined as the process by which patients take their medicines as prescribed.[1] Medication adherence is crucial for achieving the expected clinical effect hoped for when a drug is prescribed.[2] In the real world adherence of majority of patients is sub-optimal,[3] thus countries might not be spending their limited healthcare resources on as cost-effective interventions as they think they do.[4] Improving adherence helps to gain maximum effectiveness from medicines and refrain from the outcomes of medical conditions we are trying to prevent.[5]

Adherence can be divided into primary and secondary adherence.[6] Primary medication non-adherence (PMN) occurs when a new medication is prescribed for a patient, but the patient does not obtain the medication within an acceptable period of time after it was prescribed. Secondary non-adherence measures prescription refills among patients who previously filled their first prescriptions.[7] Aspects of non-adherence that occur after first dispensing of a medicine have been studied thoroughly but in contrast pre-initiation non-adherence has not. The reasons for this are primarily resource related, as most research is done based on claims databases that capture post initiation medication adherence rather well but lack information about whether the

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prescribing of medicines took place or not.[8]

ePrescribing in general may have different benefits: economic benefits, health benefits and social benefits.[9] In addition, the increasing use of electronic prescribing systems[10] is enhancing the possibilities to study primary medication non-adherence as both - the act of prescribing and dispensing are saved at the same database or are easily collated from different databases.[11]

Electronic prescribing was implemented in Estonia in the beginning of 2010 and it is a part of the Estonian eHealth system[12] that combines Electronic Health Record, Digital Registration, Digital Image, and Digital Prescription projects and is the central storage for all various medical records in Estonia.[13] Estonian ePrescribing system is one of the most comprehensive in Europe.[14] The system is centrally maintained by the Estonian Health Insurance Fund (EHIF) that runs the Prescription Centre. Both - prescribing and dispensing of ambulatory medicines are carried out using the Prescription Centre. Physicians and pharmacists use third party software for their interfaces, but these systems are all connected to the central Prescription Centre. Patients can choose any pharmacy in Estonia from where they want the medicine to be dispensed. At the moment over 99% of ambulatory medicines in Estonia are prescribed digitally and 100% are dispensed using the Prescription Centre as paper prescriptions are inserted in the Prescription Centre in the pharmacy while dispensing.[12]

For every prescription issued using the ePrescription system the date of prescribing, prescription number and type, patient's identifier, age, sex and diagnosis code, medicines active substance(s), strength(s), dosage form, instructions for administration and rate of reimbursement and the doctors name and speciality are saved in the database. If a digital prescription or a paper prescription is dispensed the date of dispensing, package details and number of packages delivered, the name of the pharmacist and pharmacy, amount paid by EHIF, the patient and in total and comments by the pharmacist if there are any are added to the data of the prescription (Table 1).

The rate of primary medication non-adherence varies substantially between drug classes[15] with osteoporosis medicines showing one of the highest rates.[16] Though the treatment of osteoporosis has to last for several years it does not cause pain or other symptoms until a fracture occurs. Thus patients tend to underestimate its severity which leads to lower adherence to treatment.[17] Poor adherence to these medicines could result in a disabling fracture of the hip or other major site.[18] Because of these reasons osteoporosis medicines were selected to serve as an example of the possible use of Estonian ePrescription system to assess PMN.

The aim of this study was to introduce the possibilities of the Estonian ePrescriptions database. The more specific objectives were firstly to evaluate PMN with osteoporosis medicines and the time interval between prescribing and dispensing of these medicines and secondly building from the undertaken analysis assess database usability for adherence research.

Table 1
Data in the Estonian Prescription Centre about every prescription.

Data inserted when prescribed	Data added when dispensed
Date of prescribing	Date of dispensing
Prescription number and type	Details of package dispensed (which preparation, number of tablets etc.)
Patient's identifier	Number of packages dispensed
Age and sex of the patient	Name of the pharmacist and pharmacy
Diagnosis code	Amount paid by EHIF, the patient and in total
Active substance(s)	Comments by the pharmacist if there are any
Dosage form	
Instructions for administration	
Rate of reimbursement	
Prescribing doctors name and speciality	

2. Methods

2.1. Setting and study cohort

Data was extracted from the EHIF Prescription Centre about all prescriptions issued for osteoporosis medicines in Estonia from 2012 to 2015 with information linked to each patient if one had had a prescription of osteoporosis medication in the prior year or not. Dispensing data of medicines was extracted for the same time period with an additional 60 days after the end of the year so all prescriptions were followed up until dispensing or expiration. Data on other than the initial prescription were obtained in order to assess whether patients purchase subsequent prescriptions after failing to purchase the first.

For every prescription date of prescribing and dispensing; patients' (age and gender) and doctors' (speciality) data; the active substance prescribed, the diagnosis code, the medicine dispensed and the amount paid by EHIF and the patient were extracted from the Prescription Centre.

Start of treatment was defined as not having a prescription of osteoporosis medicines at least 1 year before. Patients older than 18 years of age were analysed.

EHIF uses encrypted patient identifiers for data extraction, meaning a patient can be linked to all of ones prescriptions but the patients actual identity is not revealed therefore ethics committee approval was not needed to conduct this study.

2.2. Osteoporosis medicines

Osteoporosis medicines were defined as belonging to ATC group M05B - drugs affecting bone structure and mineralization. Parathyroid hormones and selective estrogen receptor modulators (SERMs) that could also be used to treat osteoporosis do not belong to the same ATC group but they are not used in Estonia.[19]

2.3. Primary medication non-adherence (PMN) and time to dispensing

PMN was defined as the first prescription not being dispensed within 60 days after prescribing as in Estonia prescriptions are valid for 60 days. This means that if a patients' first osteoporosis medicine prescription expired without being dispensed one was considered primary non-adherent. Patients who died less than 60 days after their first prescription were excluded from the study.

In addition to PMN the time from prescribing to dispensing was calculated.

If a patient failed to purchase the first prescription and was considered primary non-adherent they were still followed up until the end of the study to analyse whether they started treatment later.

2.4. Data analysis

Statistical analyses were done using MS Excel and Stata v12 (StataCorp LP). Comparison of primary adherent/non-adherent patients by background variables was done by multiple logistic regression. Results are presented by adjusted odd ratio (OR) and 95% confidence interval. P-values less than 0.05 were considered statistically significant.

3. Results

3.1. Patients

During this study 172,011 prescriptions of osteoporosis medicines to 15,629 patients were issued in Estonia. Out of all patients 7124 had a prior prescription of osteoporosis medicines and 101 patients were